

C&EE 141

Construction Documents Overview

Construction Documents

- Construction documents define the work that is designed by the structural engineer
- Primary means of communication
- Typically define the finished structure, not the methods of construction

Construction Documents

- Drawings
 - Graphical depiction of work
 - Callouts
 - Dimensions
 - Notes
- Specifications
 - Written description of requirements for work
- Calculations are not construction documents
 - They merely justify the design meets the project requirements

Drawing Overview

- Common Drawing Elements
- General Notes
- Plans
- Elevations
- Sections
- Column Schedules
- Details

Common Drawing Elements

- Title Block
- Sheet name
- Sheet number
- Detail numbers
- Callouts

Sheet Name

BUILDING C: GYMNASIUM
BRACED FRAME ELEVATIONS

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APR03- 104577
AC _____ FLS _____ SS _____
DATE _____



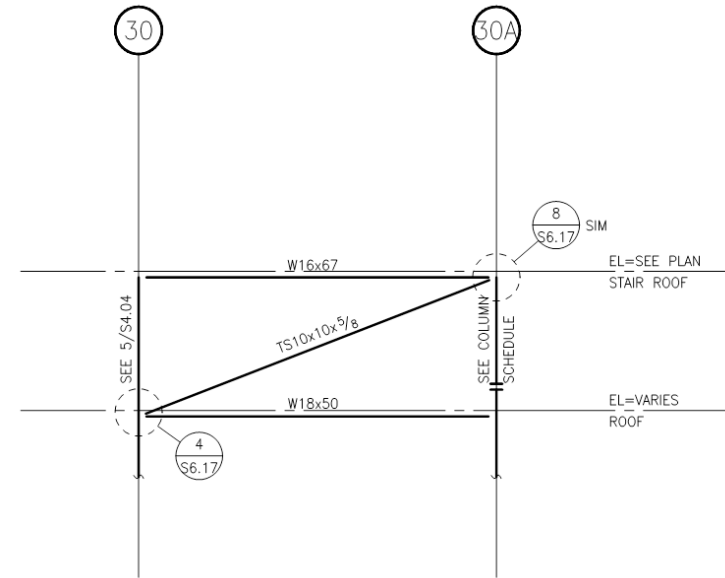
JOB #991481

1

S4.05

Sheet Number

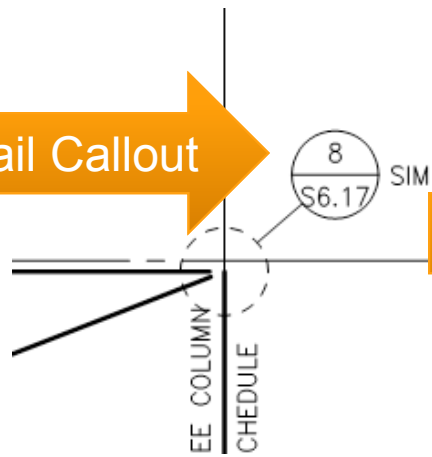
Detail Number



6

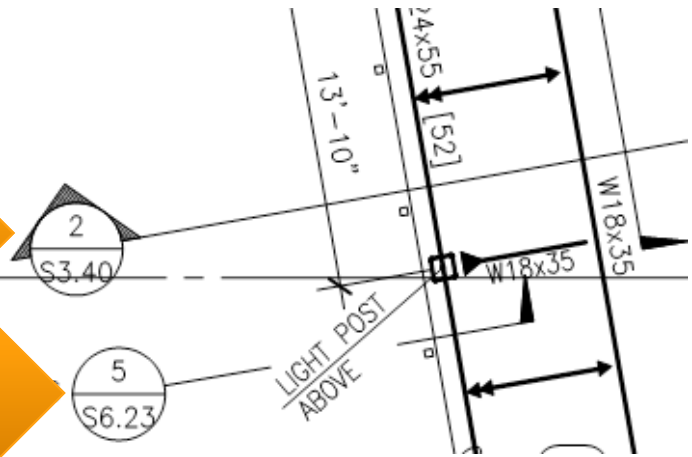
FRAME ELEV @ LINE Q
1/8"=1'-0"

Detail Callout

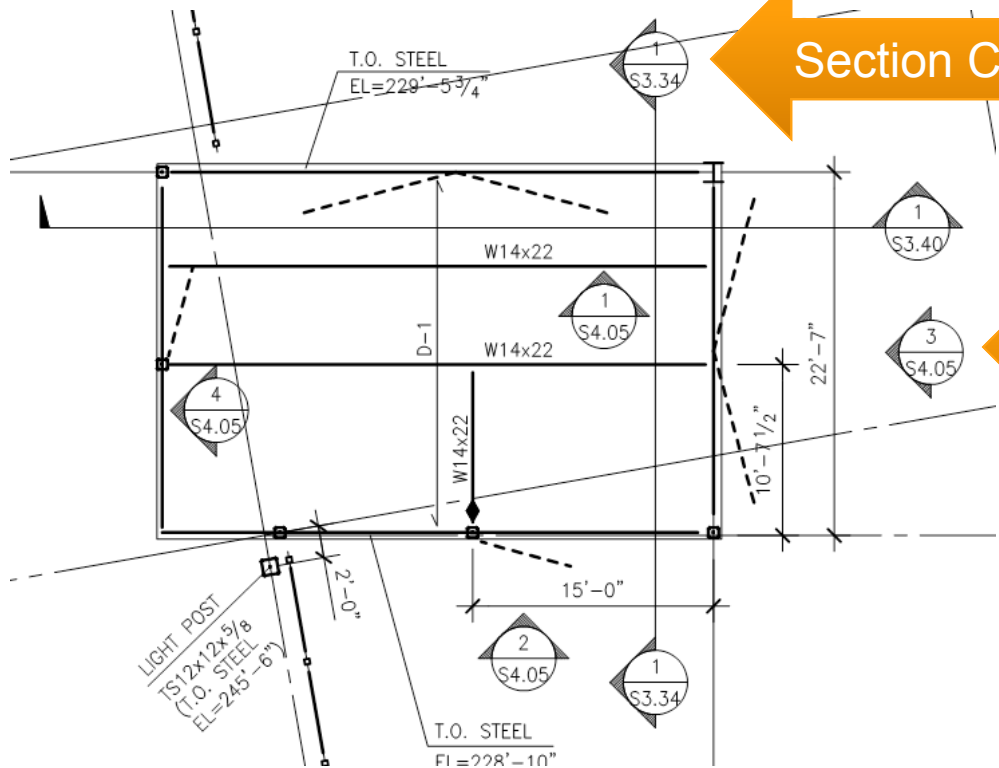


Section Callout

Detail Callout



Section Callout



Elevation Callout

General Notes

- Provide general requirements of the project that apply to all sheets in the document
 - Code basis
 - Loading criteria
 - Material specifications
 - Limitations of scope, definition of responsibilities
 - Limitations or requirements for construction methods
 - Testing, inspection and observation requirements

STRUCTURAL NOTES

GENERAL

1. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION. THE ARCHITECT SHALL BE NOTIFIED OF ANY DISCREPANCIES OR INCONSISTENCIES.
2. ALL DRAWINGS ARE CONSIDERED TO BE A PART OF THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REVIEW AND COORDINATION OF ALL DRAWINGS AND SPECIFICATIONS PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES THAT OCCUR SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT PRIOR TO START OF CONSTRUCTION SO THAT A CLARIFICATION CAN BE ISSUED. ANY WORK PERFORMED IN CONFLICT WITH THE CONTRACT DOCUMENTS OR ANY CODE REQUIREMENTS SHALL BE CORRECTED BY THE CONTRACTOR AT THEIR OWN EXPENSE AND AT NO EXPENSE TO THE OWNER OR ARCHITECT.
3. NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE GIVEN, CONSTRUCTION SHALL BE AS SHOWN FOR SIMILAR WORK.
4. ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF THE FOLLOWING CODES:

1998 CALIFORNIA BUILDING CODE VOLUME 2, TITLE 24, REFERRED TO HERE AS "THE CODE", AND ANY OTHER REGULATING AGENCIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK, INCLUDING THE STATE OF CALIFORNIA DIVISION OF INDUSTRIAL SAFETY, AND THOSE CODES & STANDARDS LISTED IN THESE NOTES AND SPECIFICATIONS.

11. CONTRACTOR SHALL INVESTIGATE SITE DURING CLEARING AND EARTHWORK OPERATIONS FOR FILLED EXCAVATIONS OR BURIED STRUCTURES, SUCH AS CESSPOOLS, CISTERNS, FOUNDATIONS, ETC. IF ANY SUCH STRUCTURES ARE FOUND, STRUCTURAL ENGINEER SHALL BE NOTIFIED IMMEDIATELY.
12. CONSTRUCTION MATERIAL SHALL BE SPREAD OUT IF PLACED ON FRAMED ROOF OR FLOOR. LOAD SHALL NOT EXCEED THE DESIGN LIVE LOAD PER SQUARE FOOT. PROVIDE ADEQUATE SHORING AND/OR BRACING WHERE STRUCTURE HAS NOT ATTAINED DESIGN STRENGTH.

13. WIND ANALYSIS PER CHAPTER 16A DIVISION III OF THE CODE

BASIC WIND SPEED 70 MPH ($Q_s=12.6$ PSF)
EXPOSURE C
SPECIAL OCCUPANCY STRUCTURES ($I_w=1.00$)

14. SEISMIC ANALYSIS PER CHAPTER 16A DIVISION IV OF THE CODE,
UTILIZING RESPONSE SPECTRUM ANALYSIS.

Z = 0.4 ZONE 4
I = 1.15 SPECIAL OCCUPANCY STRUCTURE
R = 6.4 SPECIAL CONCENTRIC BRACED FRAME

SEISMIC DESIGN PARAMETERS FOR BUILDINGS A, B, AND C IS BASED ON SOILS
REPORT BY GEOSYSTEMS REPORT NO. GS00-110, DATED MARCH 3, 2000.

SEISMIC SOURCE TYPE = B
SOIL PROFILE = S_D

15. DESIGN LOADS PER LOADING CRITERIA SHEETS S0.11 TO S0.15.

SPECIAL INSPECTIONS

THE FOLLOWING ELEMENTS OF CONSTRUCTION SHALL HAVE CONTINUOUS INSPECTION BY A SPECIAL INSPECTOR APPROVED FOR THAT PURPOSE BY DSA.

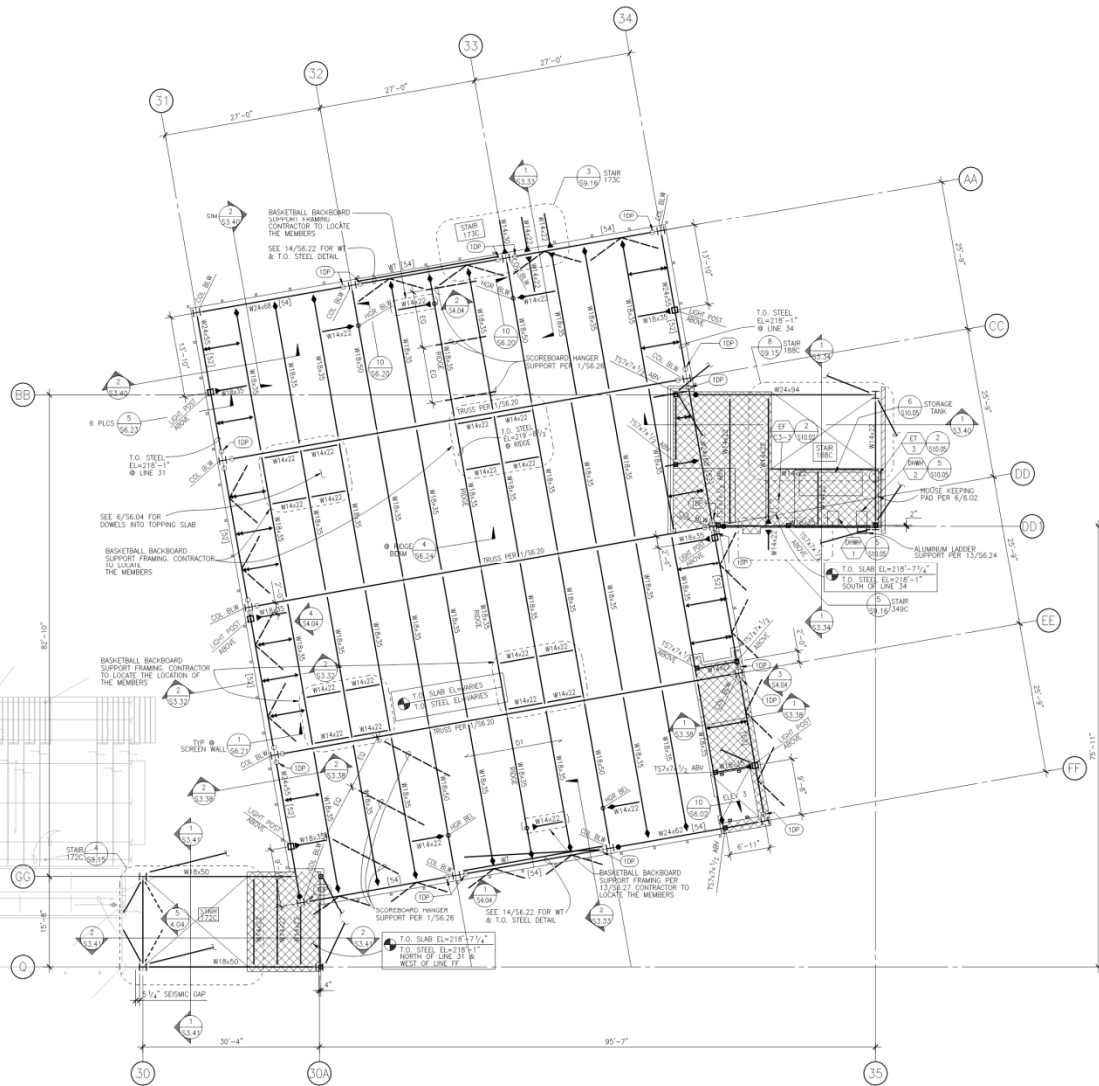
1. CONCRETE.
2. BOLTS INSTALLED IN CONCRETE.
3. ALL STRUCTURAL WELDING, INCLUDING REINFORCING STEEL.
4. PLACING OF REINFORCING STEEL.
5. HIGH STRENGTH BOLTING.
6. STRUCTURAL MASONRY AND VENEER.
7. SEE GEOTECHNICAL ENGINEER'S REPORT FOR SPECIFIC INSPECTION REQUIREMENTS BY SOILS ENGINEER'S REPRESENTATIVE.
8. INSTALLATION OF EXPANSION ANCHORS
9. INSTALLATION OF ADHESIVE ANCHORS
10. INSTALLATION OF METAL DECK AND HEADED STUDS

ALL SPECIAL INSPECTIONS SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 1701A OF THE CODE AND ANY ADDITIONAL REQUIREMENTS STATED IN THESE DRAWINGS AND/OR THE PROJECT SPECIFICATIONS.

Plans

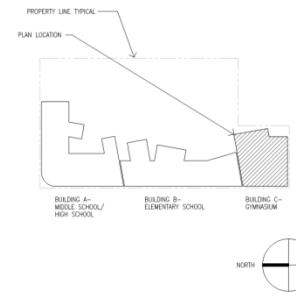
- Depiction of the structure in “plan” (horizontal view)
 - Horizontal control (grids, north arrow)
 - Horizontal framing (beams, girders, slabs)
 - Foundations
 - Callouts for sections, elevations and details
 - Sheet notes
- Typically one framing plan drawing per floor (unless floors are identical)

ROOF FRAMING PLAN

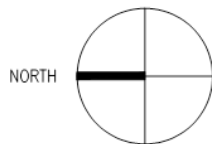


- TYPICAL FRAMING NOTES:**
1. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT SHOWN.
 2. SEE SHEET 10.01 FOR GENERAL NOTES.
 3. SEE MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS FOR FLOOR PENETRATIONS NOT SHOWN.
 4. SEE SHEETS 10.01 TO 10.05 FOR BRACED FRAME ELEVATIONS.
 5. SEE SHEETS 10.01 TO 10.04 FOR THE COLUMN SCHEDULE.
 6. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 7. SEE SHEETS 10.01 TO 10.04 FOR BRACED FRAME CONNECTION DETAILS.
 8. SEE SHEETS 10.01 TO 10.04 FOR STEEL DETAILS.
 9. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 10. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 11. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 12. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 13. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 14. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 15. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 16. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 17. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 18. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 19. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 20. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 21. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 22. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 23. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 24. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 25. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 26. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 27. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 28. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 29. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 30. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 31. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 32. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 33. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 34. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 35. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 36. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 37. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.
 38. SEE SHEETS 10.01 TO 10.04 FOR TYPICAL STEEL DETAILS.





NOTES



KEY PLAN

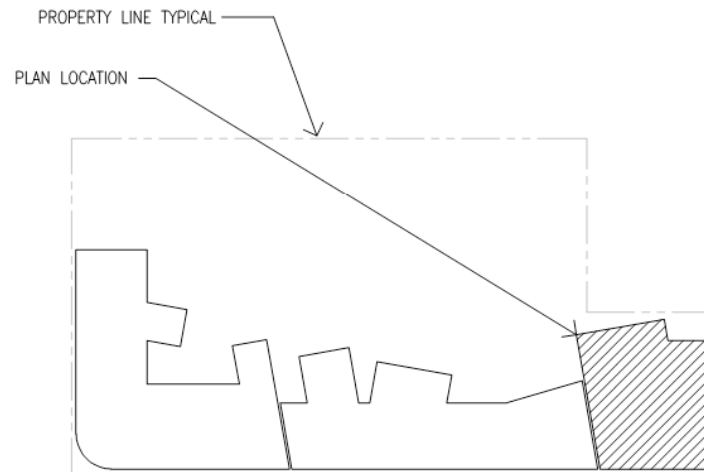


3 SCALE:
1/8" = 1'-0"

33.  INDICATES THE M.E.P. EQUIPMENT.
34. FOR HOUSEKEEPING PAD DETAIL SEE 6/S6.02
35. SEE 12/S6.01 FOR SIZE OF WT AT DEPRESSED FRAMING.
36.  INDICATES DOUBLER PLATE PER 5/S6.05.
37.  INDICATES A WELDED DRAG CONNECTION PER DETAIL 7/S6.05
38.  INDICATES AREA OF BUILT-UP SLAB PER 8/S7.10

NOTES

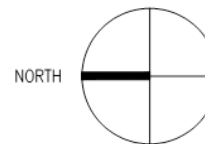
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BUILDING A—
MIDDLE SCHOOL/
HIGH SCHOOL

BUILDING B—
ELEMENTARY SCHOOL

BUILDING C—
GYMNASIUM

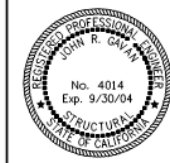


KEY PLAN

2

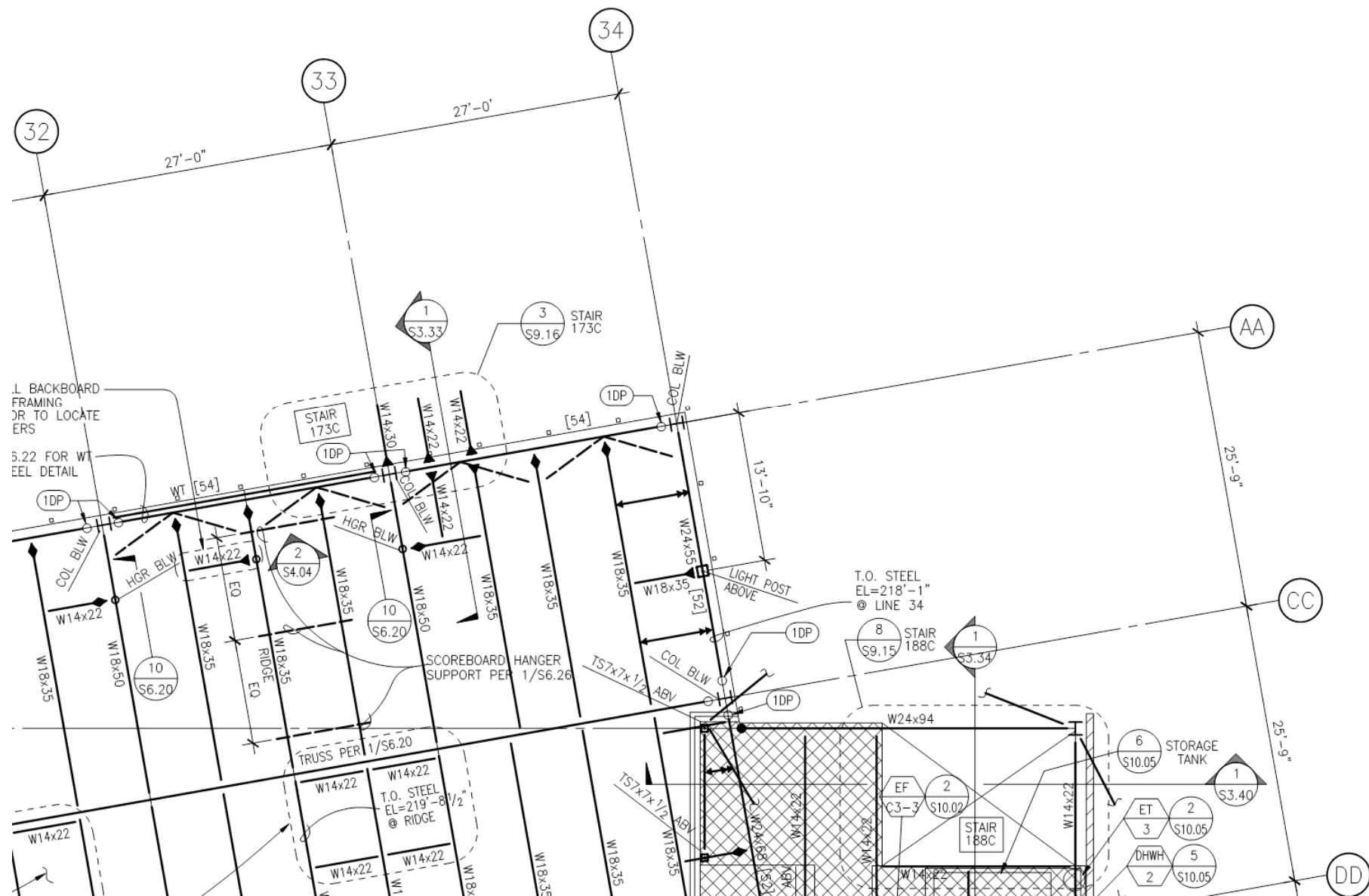
BUILDING C: GYMNASIUM THIRD FLOOR PLAN

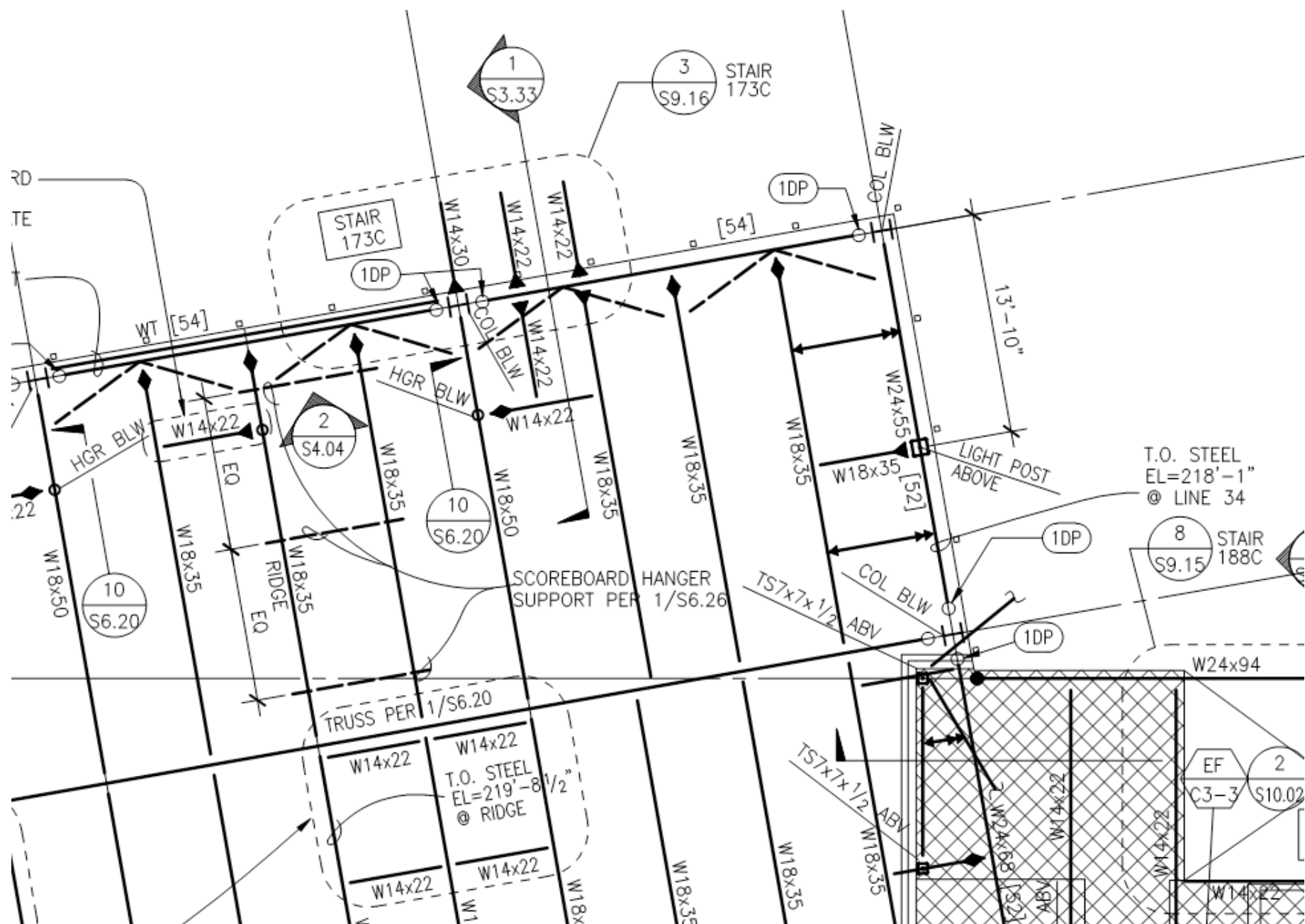
IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP03- 104577
AC FLS SS
DATE









JOB #991481

S2.13C.2





TYPICAL FRAMING NOTES:

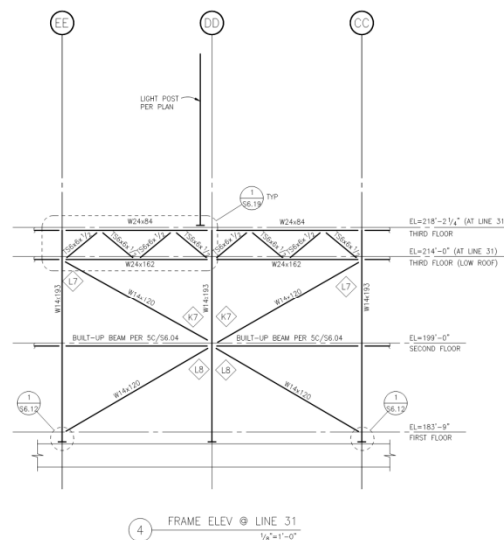
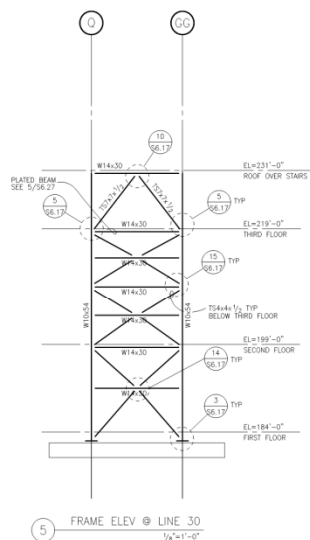
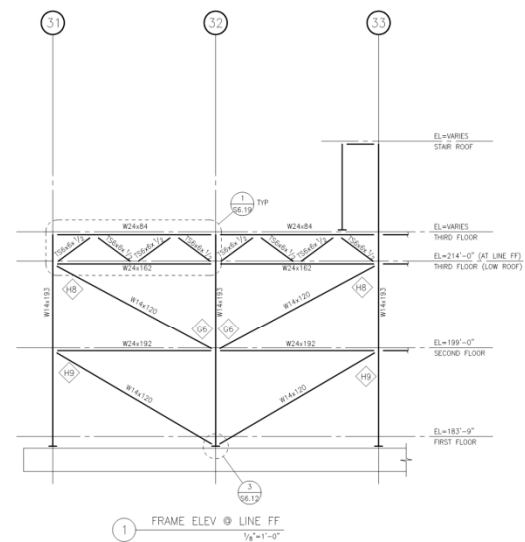
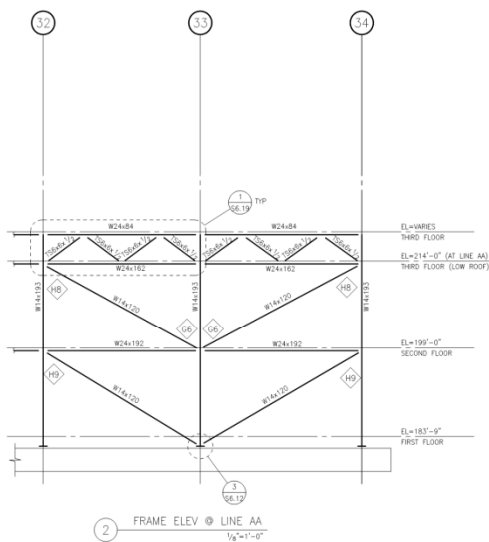
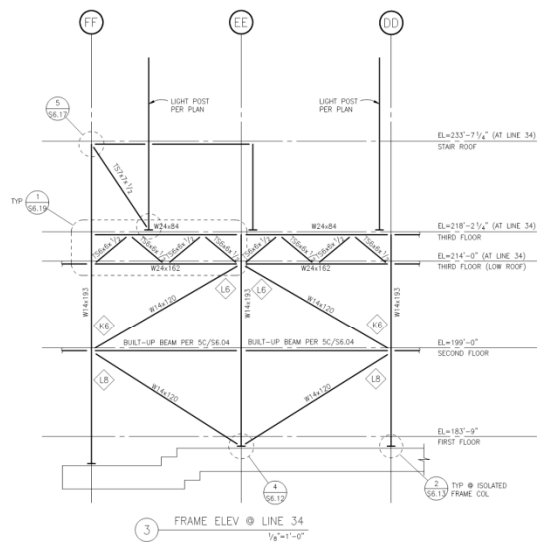
1. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT SHOWN.
2. SEE SHEET S0.01 FOR GENERAL NOTES.
3. SEE MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS FOR FLOOR PENETRATIONS NOT SHOWN.
4. SEE SHEETS S4.01 TO S4.05 FOR BRACED FRAME ELEVATIONS.
5. SEE SHEETS S5.01 TO S5.04 FOR THE COLUMN SCHEDULE.
6. SEE SHEETS S6.01 TO S6.04 FOR TYPICAL STEEL DETAILS.
7. SEE SHEETS S6.10 TO S6.19 FOR BRACED FRAME CONNECTION DETAILS.
8. SEE SHEETS S6.20 TO S6.29 FOR STEEL DETAILS.
9.  T.O.SLAB=X'-X" INDICATES TOP OF SLAB ELEVATION
T.O.STEEL=X'-X" INDICATES TOP OF STEEL ELEVATION
10. (-X") INDICATES TOP OF STEEL ELEVATION OF STEEL BEAM OR COLUMN WHERE BELOW THE REFERENCED TOP OF STEEL ELEVATION INDICATED BY  $\frac{\text{T.O.SLAB} = X' - X''}{\text{T.O.STEEL} = X' - X''}$
11.  INDICATES FLOOR ELEVATION CHANGE.
12.  INDICATES CONCRETE CURB AND FLOOR ELEVATION CHANGE.
13.  INDICATES CONCRETE FILL ON METAL DECK TYPE PER 13/S6.02
14. ALL BEAMS TO BE EQUALLY SPACED BETWEEN COLUMNS UNLESS NOTED OTHERWISE.
15.  INDICATES # OF BOLTS REQUIRED AT BEAM CONNECTION. SEE DETAIL 1/S6.01 NOTE #7.
16. [#] INDICATES # OF SHEAR STUDS REQUIRED. PROVIDE A MINIMUM OF ONE STUD PER FOOT TYPICAL ON ALL BEAMS WHERE STUDS AS INDICATED BY [#], ARE NOT SHOWN. SEE DETAILS 3, 4, AND 5 ON S6.02.

Elevations

- Depiction of the structure in “elevation” (vertical view)
 - Walls, wall reinforcement
 - Frames
 - Frame connection detail references

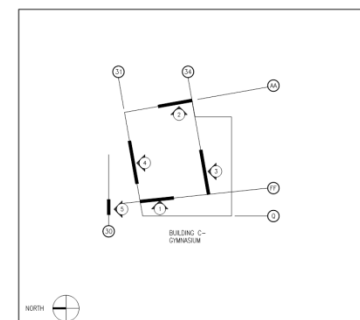
| NOTES | JOB # | JOB NAME | FILE PATH & NAME | PLOTTED DATE & TIME | UPDATED BY | ROT SCALE | PROGRAM |
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| | 991481 | THE ACCELERATED SCHOOL | H:\991481\54_04106 | JUL 16, 2001 2:15:53 PM | | 1=1 | ADP |
| | 991481B | | | | | | DRAFTER |

FRAME ELEVATIONS



T1 INDICATES BRACE CONNECTION ID PER DETAILS ON SHEETS S6.10 THROUGH S6.16 (LETTER = CONNECTION TYPE, NUMBER = CASE ID)

NOTE: FLOOR ELEVATIONS SHOWN ARE FOR THE SPECIFIC BRACE FRAMES. FOR TYPICAL FLOOR ELEVATIONS, REFER TO FLOOR PLANS.



| | |
|---|----------|
| 2 | KEY PLAN |
|---|----------|

THE ACCELERATED SCHOOL
116 E. Martin Luther King Boulevard

| |
|------------------|
| 100% CD Set |
| DSA Approval Set |
| June 15, 2001 |

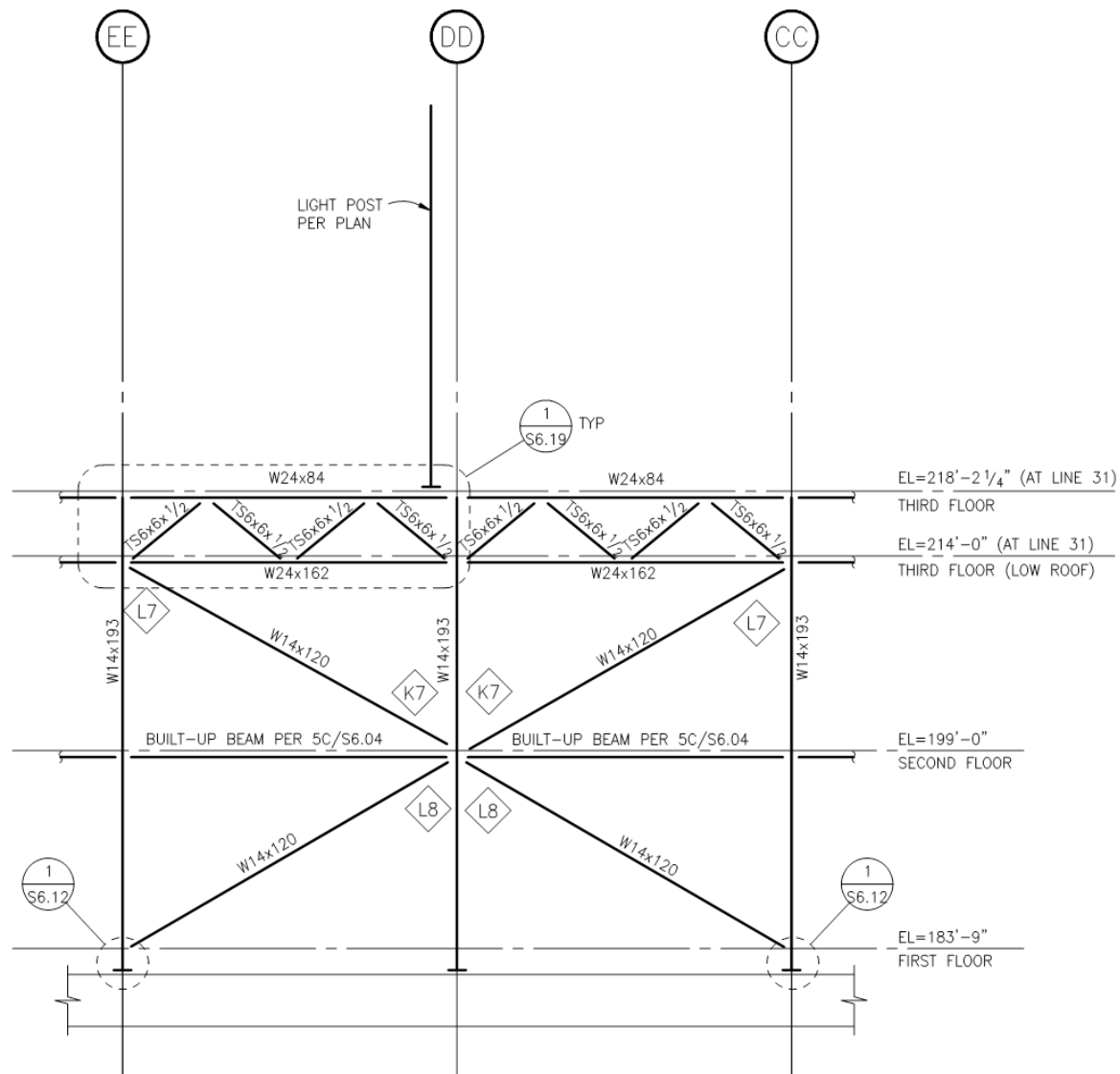
kpf Consulting Engineers
2421 Colorado Avenue, Suite 315
Santa Monica, California 90401
(310) 629-6536 Fax (310) 629-0492

BUILDING C: GYMNASIUM
BRACED FRAME ELEVATIONS

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
PROJ. 104577
AC. PLS. \$8
DATE _____



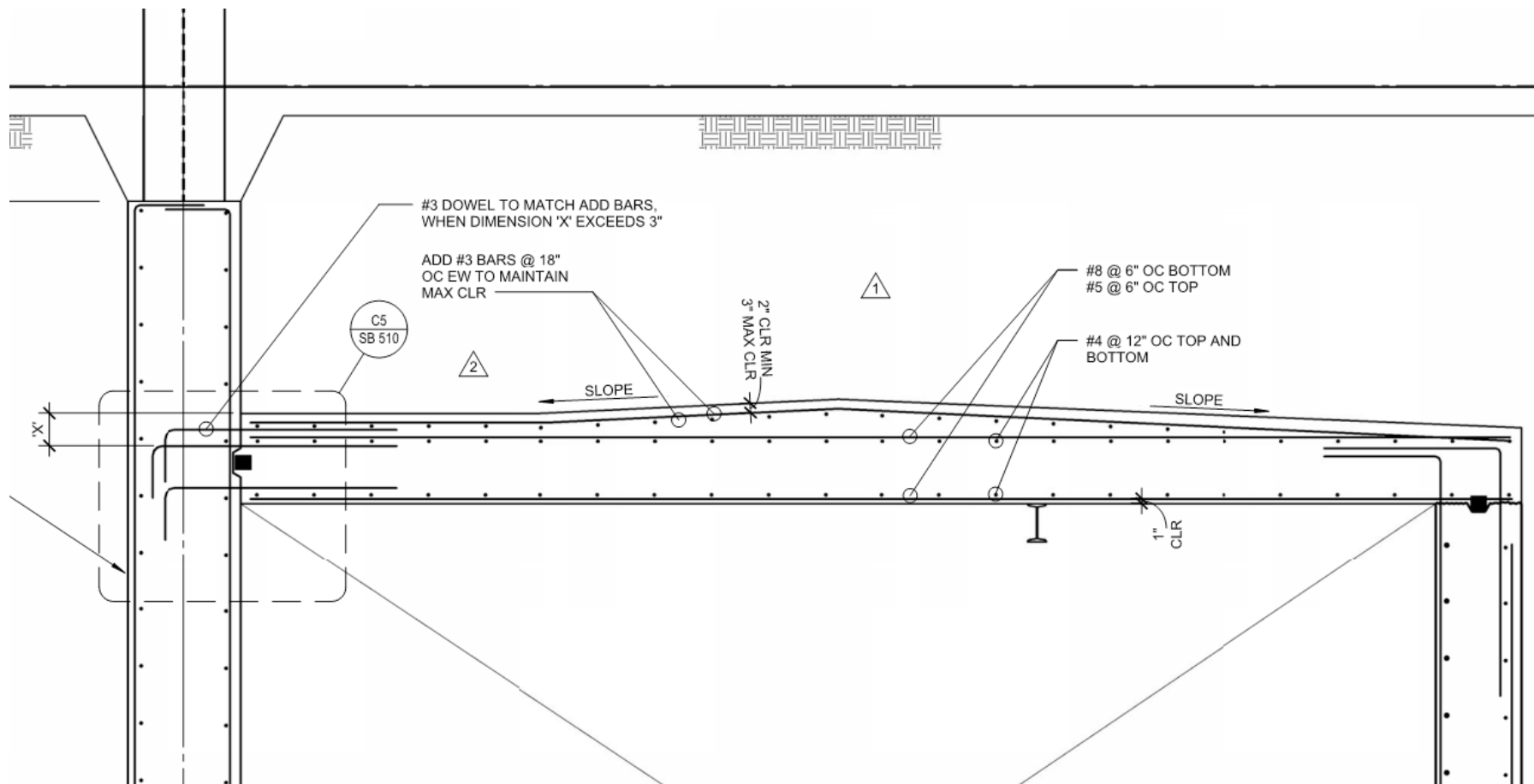
JOB #991481



4 FRAME ELEV @ LINE 31
1/8"=1'-0"

Sections

- Depiction of the structure, or specific elements of the structure, in cross-section
 - Building sections
 - Wall sections
 - Foundation sections
 - Detailed sections
- General configuration/arrangements of elements
- Call out steel connection details
- Concrete reinforcement



Column Schedules

- Depiction of the building columns in elevation
 - Identified by grid intersection (A/1, G/14, etc.)
 - Call out sections by vertical location along column shaft
 - Splice and base plate detail callouts

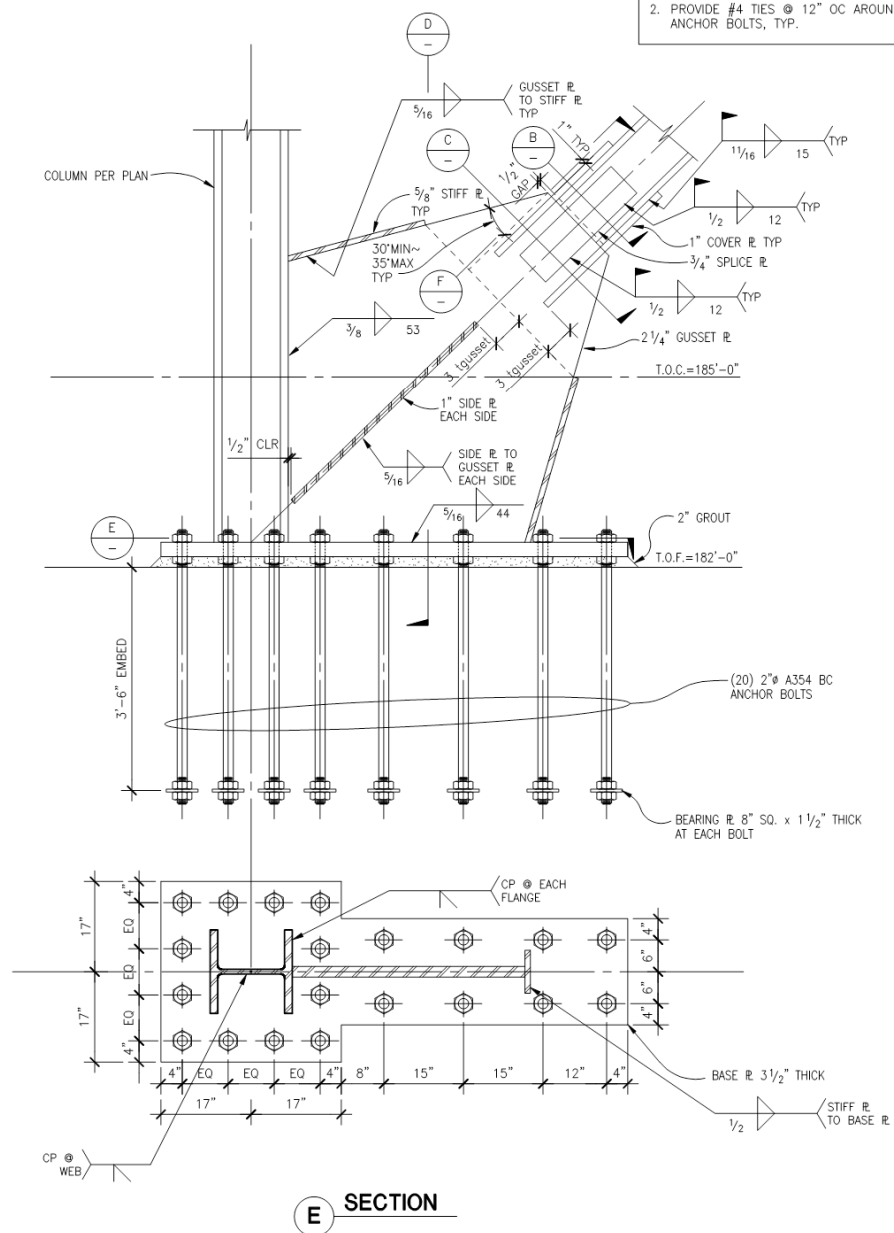
GYMNASIUM BUILDING

[illegible]

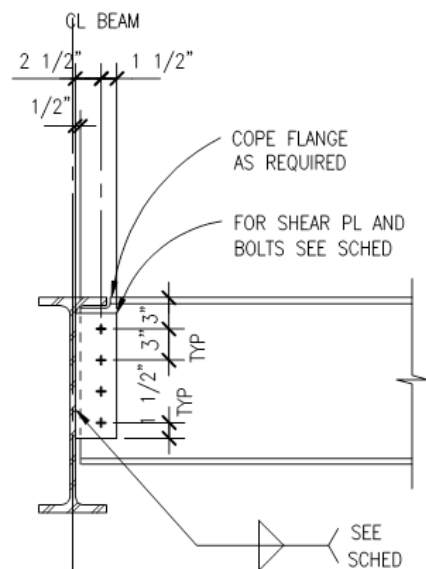
| | Q/30A | Q/30 | AA/34 | AA/33 | AA/32 | AA/31 | MARK LEVEL | |
|---|-------------|------------------------|-----------------------|-----------------------|-----------------------|-------------|---------------|--------------------------|
|) | (NON-FRAME) | (FRAME) | (FRAME) | (FRAME) | (FRAME) | (NON-FRAME) | | |
| | | | | | | | | |
| | | | | | | | | |
| | TST7x7x 1/2 | | | | | | VARIES | ROOF OVER STAIRS |
| | | | | | | | | ROOF/LEVEL 3 |
| | | | | | | | 6'-0" | LOW ROOF |
| | W14x68 | SEE FRAME ELEV 5/S4.04 | SEE FRAME ELEV 2/4.04 | SEE FRAME ELEV 2/4.04 | SEE FRAME ELEV 2/4.04 | W14x68 | 14'-0" | MEZZANINE/LEVEL 2 |
| | | | | | | | 15'-0" | LEVEL 01 (BLDG B & C) |
| | | | | | | | | |
| | | -- | -- | -- | -- | | DETAIL | COLUMN BASE PLATE |
| | 16"x16" | -- | -- | -- | -- | 16"x16" | SIZE (W x L) | |
| | 2" | -- | -- | -- | -- | 2" | THICKNESS | |

Details

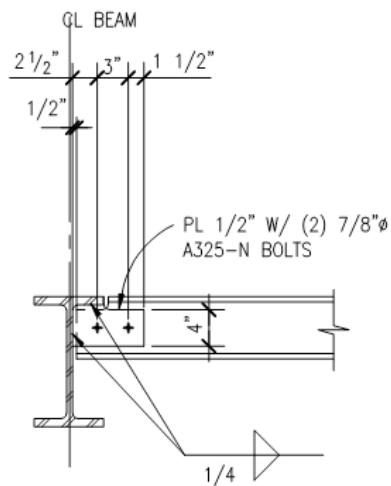
- Smaller sections, elevations and plans with requirements for specific elements of the structure
 - Steel connections (bolts, welds, plates, etc.)
 - Concrete member cross-sections (beam reinforcement)
 - How to build misc/minor elements (curbs, depressions, steps, etc.)
 - Stairs, elevators, exterior wall interfaces, etc.
- “Typical Details” apply throughout project
 - Example: Typical beam connections
- Atypical details apply only where called out



-



BEAM TO BEAM (D)



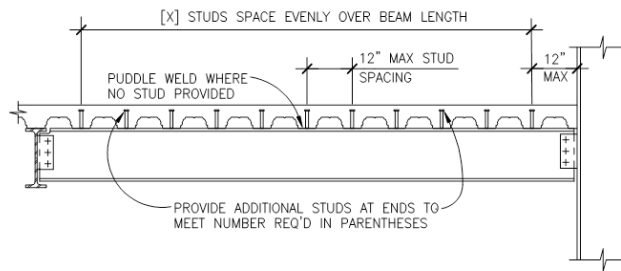
W6 OR C6 CONNECTION (E)

STANDARD BOLTED CONNECTION SCHEDULE

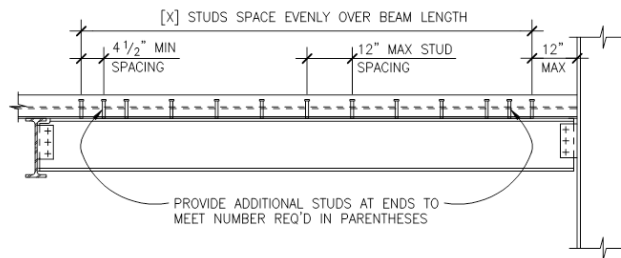
| BEAM SIZE | NO. & SIZE OF BOLTS REQUIRED | PLATE THICKNESS | WELD SIZE | CONN. CAPACITY (SINGLE SHEAR) |
|-----------|------------------------------|-----------------|-----------|-------------------------------|
| W8 C8 | (2) 7/8"Ø | 1/4" | 1/4" | 11.1K |
| W10 C10 | (2) 7/8"Ø | 1/4" | 1/4" | 11.1K |
| W12 C12 | (3) 7/8"Ø | 1/4" | 1/4" | 22.1K |
| W14 | (3) 7/8"Ø | 1/4" | 1/4" | 22.1K |
| W16 | (4) 7/8"Ø | 5/16" | 1/4" | 35.4K |
| W18 | (4) 7/8"Ø | 5/16" | 1/4" | 35.4K |
| W21 | (5) 7/8"Ø | 5/16" | 1/4" | 49.1K |
| W24 | (6) 7/8"Ø | 3/8" | 5/16" | 62.7K |
| W27 | (7) 7/8"Ø | 3/8" | 5/16" | 76.4K |
| W30 | (8) 7/8"Ø* | 7/16" | 3/8" | 83.9K |
| W33 | (9) 7/8"Ø* | 7/16" | 3/8" | 91.2K |
| W36 | (9) 7/8"Ø* | 7/16" | 3/8" | 91.2K |

CONNECTION NOTES:

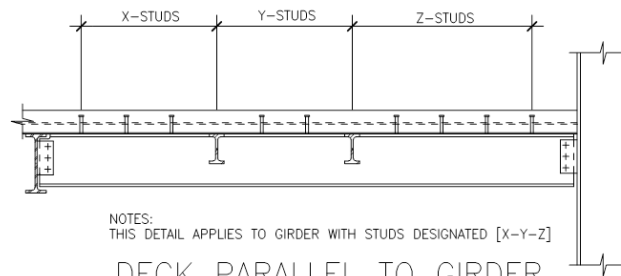
1. ALL BOLTS TO BE ASTM A325-N AND FULLY PRETENSIONED PER AISC STANDARDS EXCEPT AS DESCRIBED IN NOTE 2.
2. BOLTS IN BEAM TO BEAM CONNECTIONS SHALL BE TIGHTENED TO AISC "SNUG TIGHT" CONDITION UNLESS NOTED OTHERWISE



DECK PERPENDICULAR OR SKEWED TO BEAM



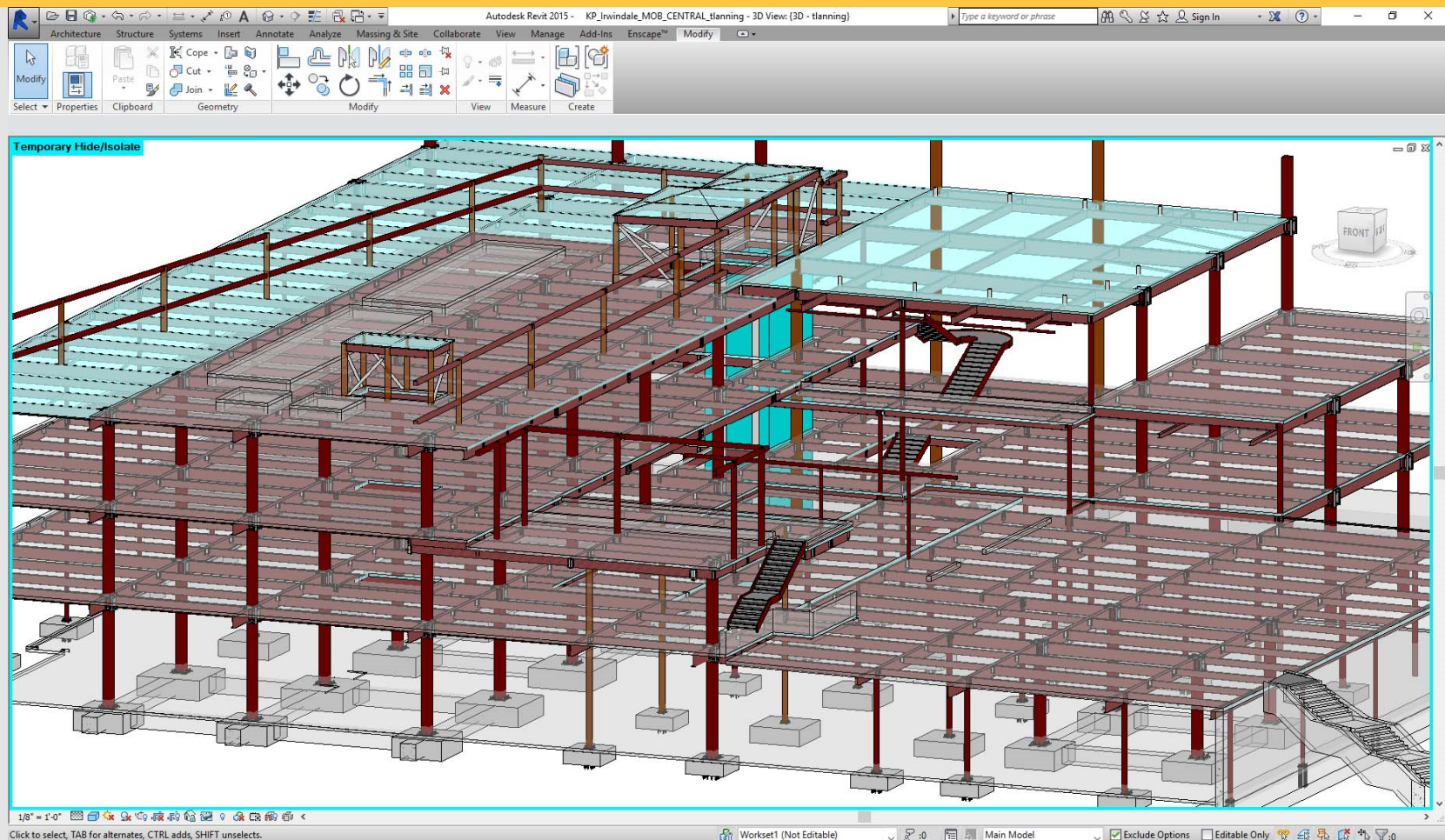
DECK PARALLEL TO BEAM



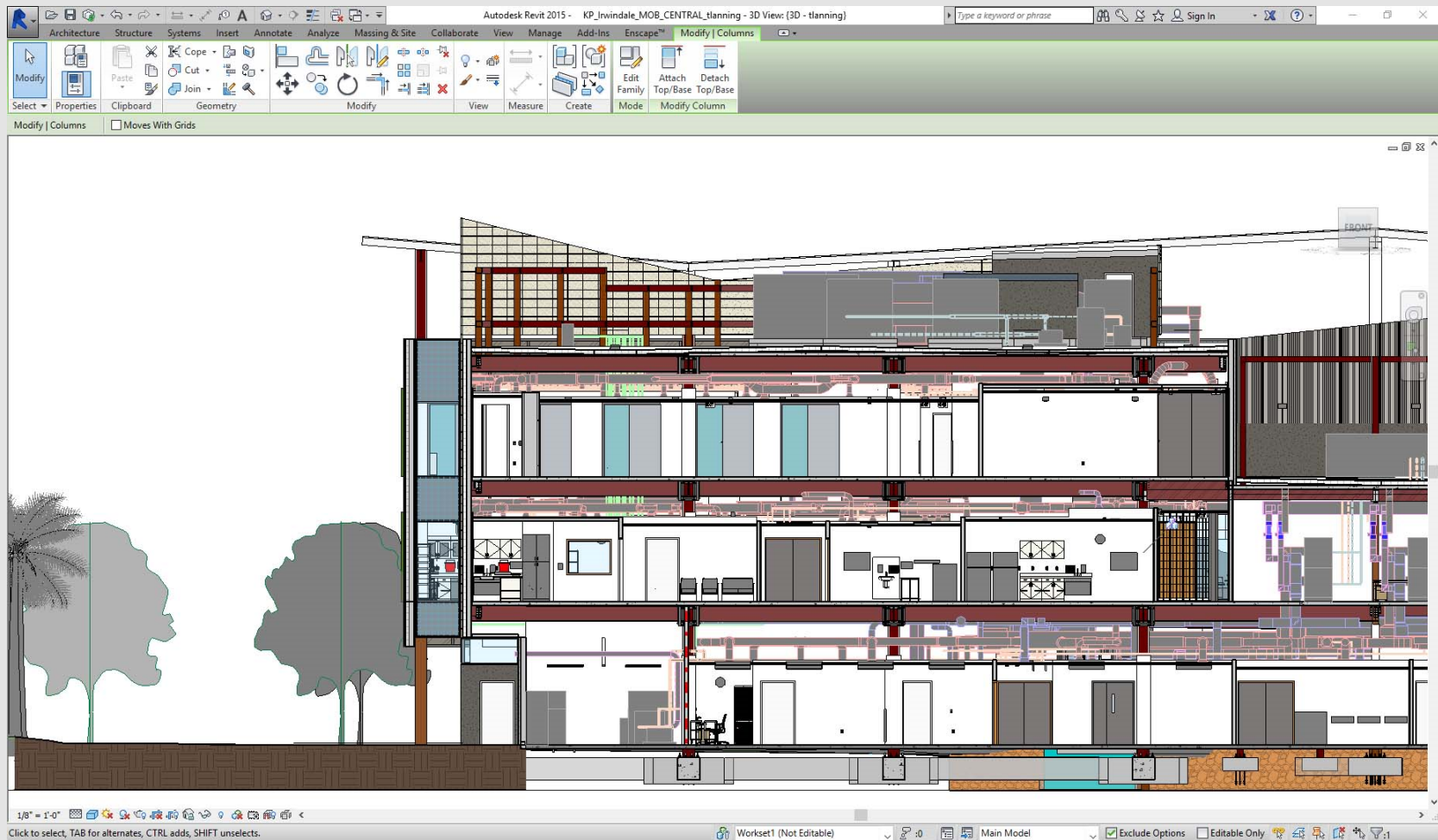
DECK PARALLEL TO GIRDER

- NOTES:
1. IF TWO STUDS ARE REQUIRED IN ONE FLUTE THE TRANSVERSE SPACING SHALL BE 3" MINIMUM
 2. UNLESS NOTED [O] ALL BEAMS AND GIRDERS THAT SUPPORT STRUCTURAL CONCRETE HAVE $\frac{3}{4}$ " ϕ x5" LONG HEADED SHEAR STUDS @ 12" OC (MAX)
 3. STAGGER STUDS AS REQUIRED TO AVOID CONFLICT WITH GUSSET PLATES.

Revit and 3D



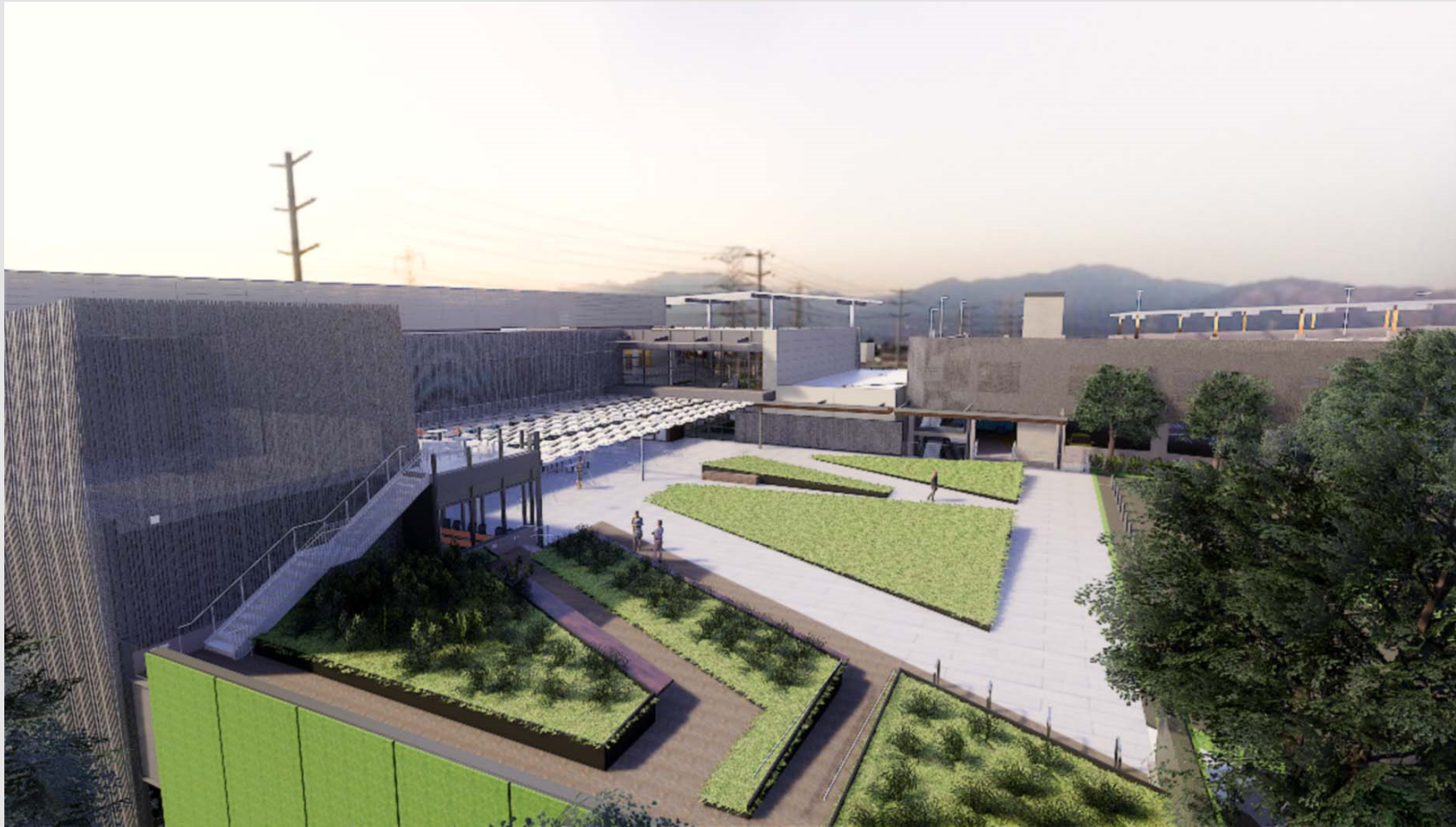
Revit and 3D



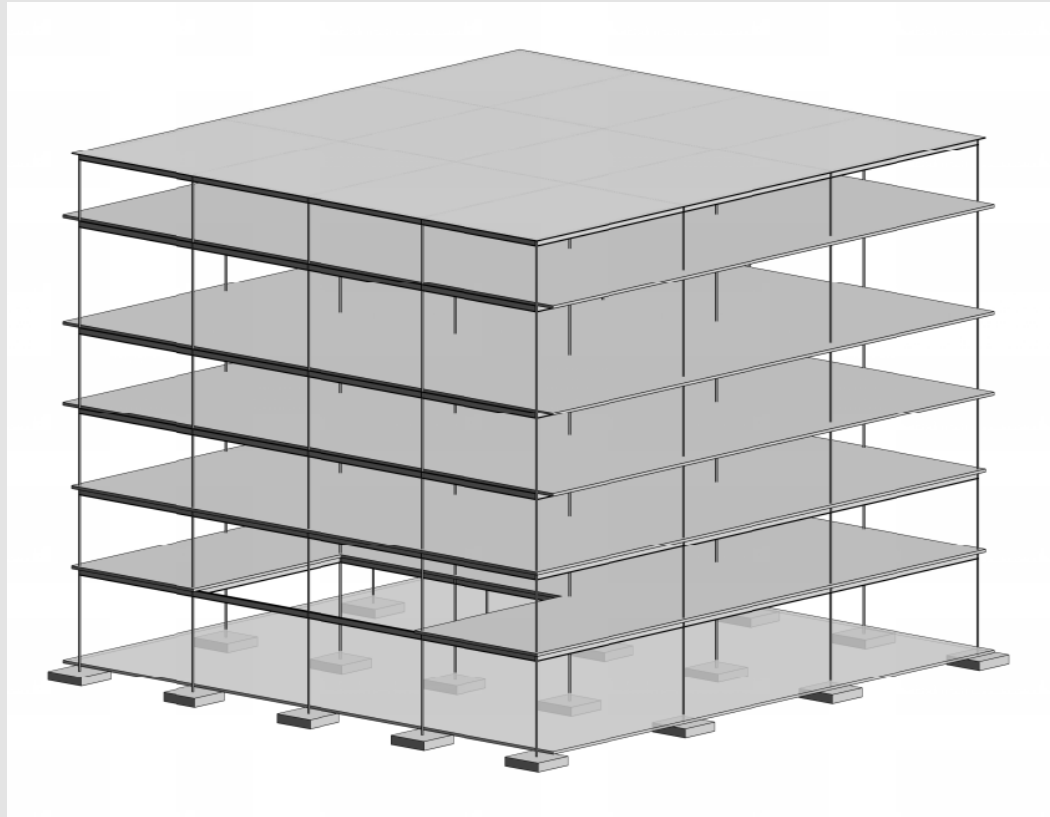
Revit and 3D



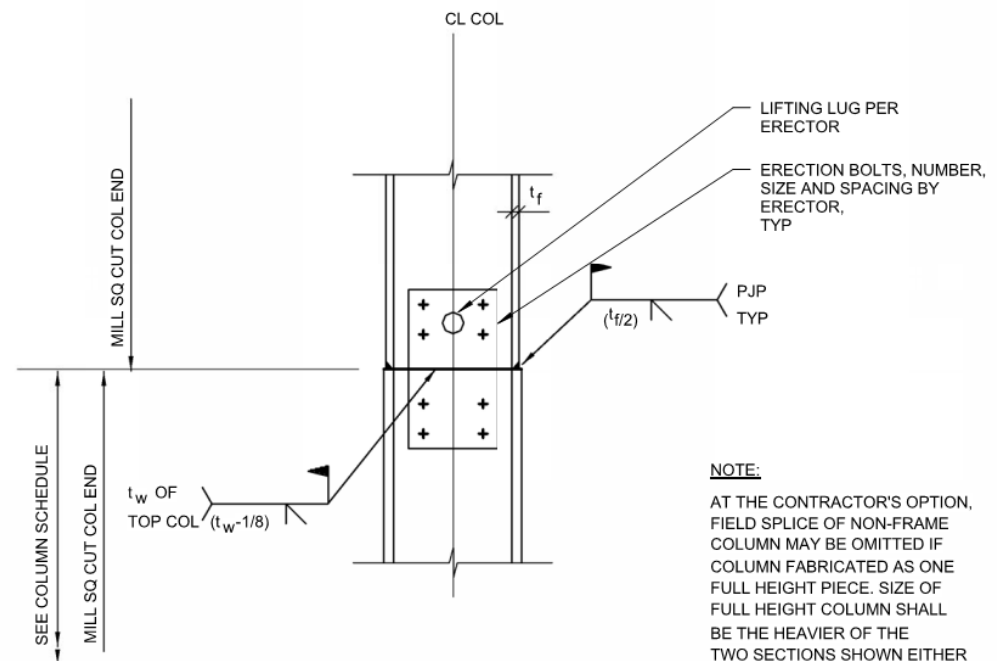
Revit and 3D



Class Project



| | |
|---------|-----------------|
| | LEVEL 05 |
| | 192' - 1" |
| W14X109 | LEVEL 04 |
| | 176' - 1" |
| | LEVEL 02 |
| | 156' - 9" |
| W14X132 | LEVEL 01 |
| | 140' - 9" |
| | (N) TOP OF PILE |
| | 128' - 9" |



NOTE:

AT THE CONTRACTOR'S OPTION, FIELD SPLICE OF NON-FRAME COLUMN MAY BE OMITTED IF COLUMN FABRICATED AS ONE FULL HEIGHT PIECE. SIZE OF FULL HEIGHT COLUMN SHALL BE THE HEAVIER OF THE TWO SECTIONS SHOWN EITHER SIDE OF THE SPLICE ON COLUMN SCHEDULE.

Good Calcs...

| | | | | | |
|---|-------------------------------|---------------|---------|--------|-----------|
| kpff Consulting Engineers 6080 Center Drive, Suite 300 Los Angeles, California 90045 (310) 465-1536 Fax: (310) 465-0370 | project | HCA Riverside | by | KCP | sheet no. |
| | location | Riverside, CA | date | 1/6/13 | |
| | client | P+W | job no. | 112206 | |
| | Drag Connection - Strong Axis | | | | |

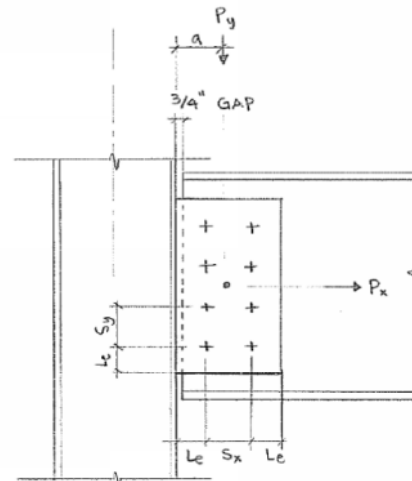
DRAG/CHORD CONNECTION - STRONG AXIS (AISC 360-05) ONE OR TWO EQUAL ROWS OF BOLTS

W24x62 Typ - HCA

DESIGN PARAMETERS

DB1

| | | |
|---------------|---|----------------------|
| Bolts | Bolt Type | A490N |
| | Bolt Diameter d = | 1 in |
| Bolt Geometry | Bolt F _{nv} = | 60 ksi |
| | μ (Mean Slip Coeff. Class A Surfaces) = | 0.35 |
| | T _b = Min. Bolt Pre-Tension = | 64 kips |
| | No. of bolt lines (1) or (2) = | 2 |
| | (12 max) bolts per line = | 6 bolts |
| | (24 max) total n = | 12 bolts |
| | s _x = 3 φ _{bol} = | 3 in |
| | s _y = btwn (2.67 & 3) φ _{bol} = | 3 in |
| | Min Edge Dist L _e = | 1.75 in (Table J3.4) |
| | dist from face of col to bolt group centroid = a = | 4.0 in |
| Tab Plate | dist btwn face of col web to bolt group centroid = e _b = | 11.79 in |
| | e _y = | 0 in |
| | (1)Single or (2)Double Tab Plate | 1 |
| | h _{tp} = (bolts/line-1)s _y +2L _e = | 18.5 in |
| | Tab Plate Thickness t _p = | 5/8 in |
| | Tab Plate F _y = | 50 ksi |
| | Tab Plate F _u = | 65 ksi |
| | Weld @ Tab & Column = | 1/2 in |



Block Shear: [2 Vertical Lines • 1 Horizontal Line]

$$\phi R_{bs,y} = \phi \{0.6 A_{nv,y} F_u + U_{bs} A_{nt,y} F_u\} \leq \phi \{0.6 A_{gv,y} F_y + U_{bs} A_{nt,y} F_u\} = 552 \text{ kips} \quad 2.03$$

where;

$$A_{nv,y} = t_{plate} \times \text{n.o. of plates} \{L_e - (d_o + 1/8)/2 + (\text{bolts per line} - 1) \times (s_y - (d_o + 1/8))\} \times \text{n.o. of bolt lines}$$

$$= 17.9 \text{ in}^2$$

$$A_{nt,y} = \text{One Line of Bolts: } t_{plate} \times \text{n.o. of plates} \{L_e - (d_o + 1/8)/2\}$$

$$= \text{Two Line of Bolts: } t_{plate} \times \text{n.o. of plates} \{S_x - (d_o + 1/8)\}$$

$$= 1.2 \text{ in}^2$$

$$A_{gv,y} = t_{plate} \times \text{n.o. of plates} \{L_e + (\text{bolts per line} - 1) \times s_y\} \times \text{n.o. of bolt lines}$$

$$= 28.4 \text{ in}^2$$

$$U_{bs} = 1.0 \text{ IF 1 LINE OF BOLTS ; } 0.5 \text{ IF 2 LINES OF BOLTS}$$

$$= 0.5$$

$$\phi = 0.75$$

Bad Calcs...

| Column ID | Column Size | Column Story | Height in | Height ou | X/Y | Fy | Ωo | A (in ²) | I (in ⁴) | Z (in ³) | rx (in) | ry (in) | M1/M2 | Cm | K1 | Pe1 | SPECXSC | SPECYSC | 14D05L | Pr |
|-------------|-------------|--------------|-----------|-----------|-------|----|----|----------------------|----------------------|----------------------|---------|---------|-------|-------|-----|----------|---------|---------|--------|-----|
| C5PENTHOUSE | W36X330 | C5 | PENTHOUSE | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.282 | 0.487 | 1.0 | 180905.3 | 30 | 4 | 251 | 28 |
| C5STORY6 | W36X330 | C5 | STORY6 | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.969 | 0.212 | 1.0 | 180905.3 | 77 | 8 | 348 | 42 |
| C5STORY5 | W36X395 | C5 | STORY5 | 192 | 192 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.720 | 0.312 | 1.0 | 221279 | 154 | 13 | 446 | 60 |
| C5STORY4 | W36X395 | C5 | STORY4 | 232 | 232 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.922 | 0.231 | 1.0 | 151553.7 | 251 | 17 | 547 | 79 |
| C5STORY2 | W36X529 | C5 | STORY2 | 192 | 192 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.999 | 0.201 | 1.0 | 307461.3 | 358 | 21 | 648 | 100 |
| C5STORY1 | W36X529 | C5 | STORY1 | 210 | 210 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.831 | 0.268 | 1.0 | 257012.6 | 468 | 25 | 777 | 124 |
| C5BASEMENT | W36X529 | C5 | BASEMENT | 297 | 279 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.578 | 0.369 | 1.0 | 128493.2 | 581 | 28 | 1194 | 177 |
| C5GRADEBM | W36X529 | C5 | GRADEBM | 72 | 72 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.000 | 0.600 | 1.0 | 2186392 | 686 | 32 | 1208 | 189 |
| C6PENTHOUSE | W36X330 | C6 | PENTHOUSE | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.514 | 0.394 | 1.0 | 180905.3 | 5 | 1 | 240 | 24 |
| C6STORY6 | W36X330 | C6 | STORY6 | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.905 | 0.238 | 1.0 | 180905.3 | 10 | 2 | 336 | 34 |
| C6STORY5 | W36X395 | C6 | STORY5 | 192 | 192 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.902 | 0.239 | 1.0 | 221279 | 15 | 2 | 437 | 45 |
| C6STORY4 | W36X395 | C6 | STORY4 | 232 | 232 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.923 | 0.231 | 1.0 | 151553.7 | 18 | 3 | 541 | 55 |
| C6STORY2 | W36X529 | C6 | STORY2 | 192 | 192 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.975 | 0.210 | 1.0 | 307461.3 | 21 | 3 | 645 | 66 |
| C6STORY1 | W36X529 | C6 | STORY1 | 210 | 210 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.862 | 0.255 | 1.0 | 257012.6 | 23 | 2 | 776 | 79 |
| C6BASEMENT | W36X529 | C6 | BASEMENT | 297 | 279 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.754 | 0.298 | 1.0 | 128493.2 | 20 | 1 | 1085 | 110 |
| C6GRADEBM | W36X529 | C6 | GRADEBM | 72 | 72 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.000 | 0.600 | 1.0 | 2186392 | 16 | 1 | 1101 | 111 |
| C7PENTHOUSE | W36X330 | C7 | PENTHOUSE | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.521 | 0.392 | 1.0 | 180905.3 | 0 | 1 | 236 | 23 |
| C7STORY6 | W36X330 | C7 | STORY6 | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.905 | 0.238 | 1.0 | 180905.3 | 0 | 2 | 333 | 33 |
| C7STORY5 | W36X395 | C7 | STORY5 | 192 | 192 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.893 | 0.243 | 1.0 | 221279 | 0 | 2 | 436 | 43 |
| C7STORY4 | W36X395 | C7 | STORY4 | 232 | 232 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.924 | 0.230 | 1.0 | 151553.7 | 0 | 3 | 541 | 54 |
| C7STORY2 | W36X529 | C7 | STORY2 | 192 | 192 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.979 | 0.208 | 1.0 | 307461.3 | 0 | 2 | 648 | 65 |
| C7STORY1 | W36X529 | C7 | STORY1 | 210 | 210 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.880 | 0.248 | 1.0 | 257012.6 | 1 | 2 | 755 | 75 |
| C7BASEMENT | W36X529 | C7 | BASEMENT | 297 | 279 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.745 | 0.302 | 1.0 | 128493.2 | 1 | 1 | 886 | 88 |
| C7GRADEBM | W36X529 | C7 | GRADEBM | 72 | 72 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.000 | 0.600 | 1.0 | 2186392 | 0 | 1 | 906 | 90 |
| C8PENTHOUSE | W36X330 | C8 | PENTHOUSE | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.521 | 0.392 | 1.0 | 180905.3 | 1 | 1 | 234 | 23 |
| C8STORY6 | W36X330 | C8 | STORY6 | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.905 | 0.238 | 1.0 | 180905.3 | 1 | 2 | 331 | 33 |
| C8STORY5 | W36X395 | C8 | STORY5 | 192 | 192 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.894 | 0.242 | 1.0 | 221279 | 1 | 2 | 431 | 43 |
| C8STORY4 | W36X395 | C8 | STORY4 | 232 | 232 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.922 | 0.231 | 1.0 | 151553.7 | 1 | 3 | 535 | 53 |
| C8STORY2 | W36X529 | C8 | STORY2 | 192 | 192 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.973 | 0.211 | 1.0 | 307461.3 | 1 | 3 | 639 | 64 |
| C8STORY1 | W36X529 | C8 | STORY1 | 210 | 210 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.871 | 0.252 | 1.0 | 257012.6 | 2 | 2 | 744 | 74 |
| C8BASEMENT | W36X529 | C8 | BASEMENT | 297 | 279 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.737 | 0.305 | 1.0 | 128493.2 | 1 | 1 | 920 | 92 |
| C8GRADEBM | W36X529 | C8 | GRADEBM | 72 | 72 X | 50 | 3 | 156 | 39600 | 2330 | 16 | 4 | 0.000 | 0.600 | 1.0 | 2186392 | 1 | 1 | 938 | 94 |
| C9PENTHOUSE | W36X330 | C9 | PENTHOUSE | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.515 | 0.394 | 1.0 | 180905.3 | 5 | 1 | 241 | 24 |
| C9STORY6 | W36X330 | C9 | STORY6 | 192 | 192 X | 50 | 3 | 97 | 23300 | 1410 | 15.5 | 3.83 | 0.906 | 0.238 | 1.0 | 180905.3 | 10 | 2 | 339 | 34 |
| C9STORY5 | W36X395 | C9 | STORY5 | 192 | 192 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.903 | 0.239 | 1.0 | 221279 | 16 | 2 | 442 | 45 |
| C9STORY4 | W36X395 | C9 | STORY4 | 232 | 232 X | 50 | 3 | 116 | 28500 | 1710 | 15.7 | 3.88 | 0.919 | 0.232 | 1.0 | 151553.7 | 19 | 3 | 547 | 56 |



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